



Deployed Health Surveillance Methods and Results

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AFEB Meeting

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Overview



- Force Health Protection
- Overview of Current Methods/Systems
 - Occupational & Environmental Assessments
 - Disease Surveillance
 - Injury Surveillance
 - Mortality
 - Pre- and Post-deployment Health Surveys
- Future Directions
- Summary

Episodic Health Assessments Across the Military Life



PRD-5 Mandates “Cradle to Grave Surveillance...”



Force Health Protection Goals and Needs



- If we want to:
 - Detect outbreaks
 - Natural disease
 - Chem-bio attacks
 - Maximize readiness & mission effectiveness
 - Monitor injury patterns, lost duty time, etc.
 - Evaluate exposures vs. health outcomes
- We will need:
 - Real-time global health & exposure surveillance
 - Accurate, systematic & thorough data collection
 - Locations
 - Exposures
 - Health events
 - Electronic medical records
 - Short- and long-term epidemiological analyses

Near-term to Long-term

Existing Systems/Programs



- In-theater Health & Environ Surveillance
 - Disease and Non-battle Injury Reporting
 - Occupational & Environmental Reporting
- Aeromedical Evacuation Data
- Other (Safety Reports, Trauma Registries)
- Casualty Reports (hostile injuries/deaths)
 - Personnel Component
 - Mortality Component (AFIP)
- Pre- and Post-deployment Surveys

Health Risk Reassessment

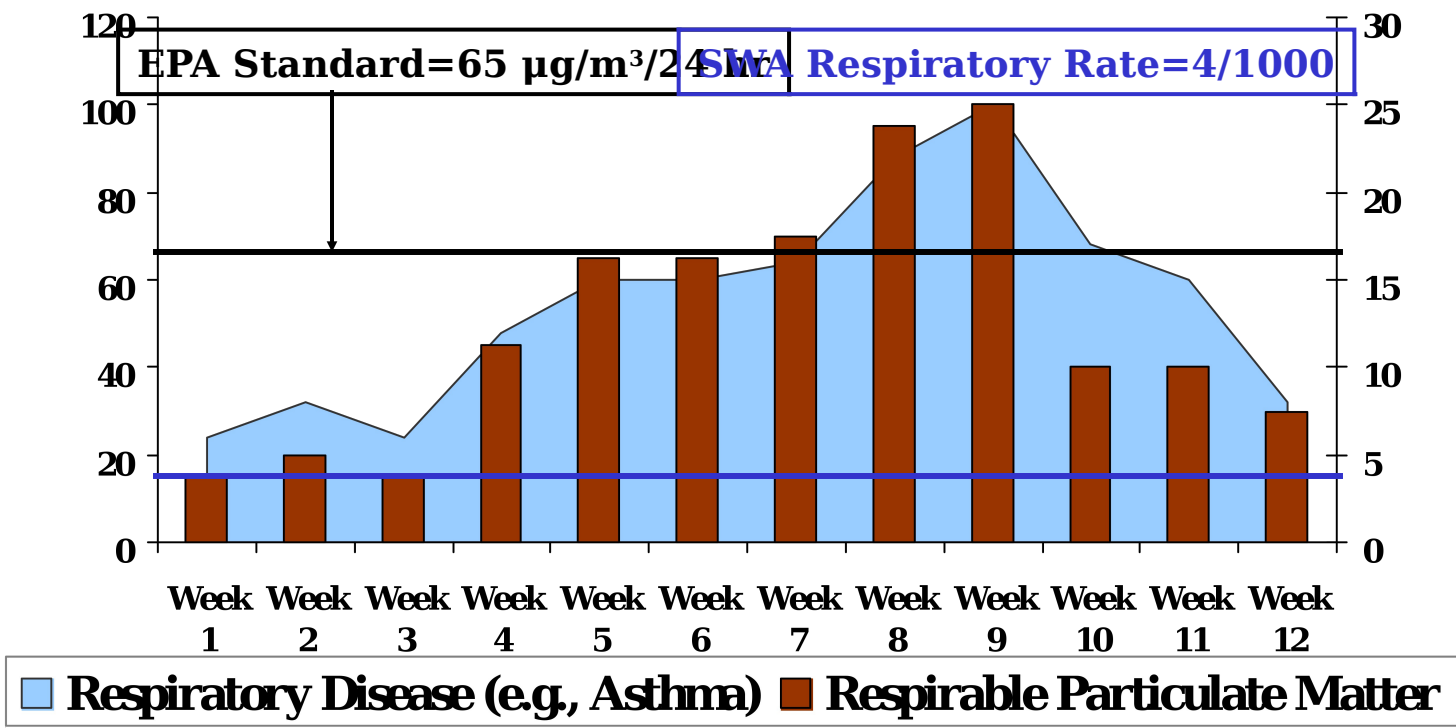


- Relies on newly collected data from the site
 - Site observations and industrial shop visits
 - Sampling and testing
 - On-site, e.g., HAPSITE, direct reading sampling tubes
 - Off-site via reference labs, e.g., CHPPM, NEHC, AFIOH
 - Newly identified sources, e.g., local health department
- Local risk assessment and additional review via reachback resources
- Methodology, qualitative vs. quantitative
 - Whose standards apply?

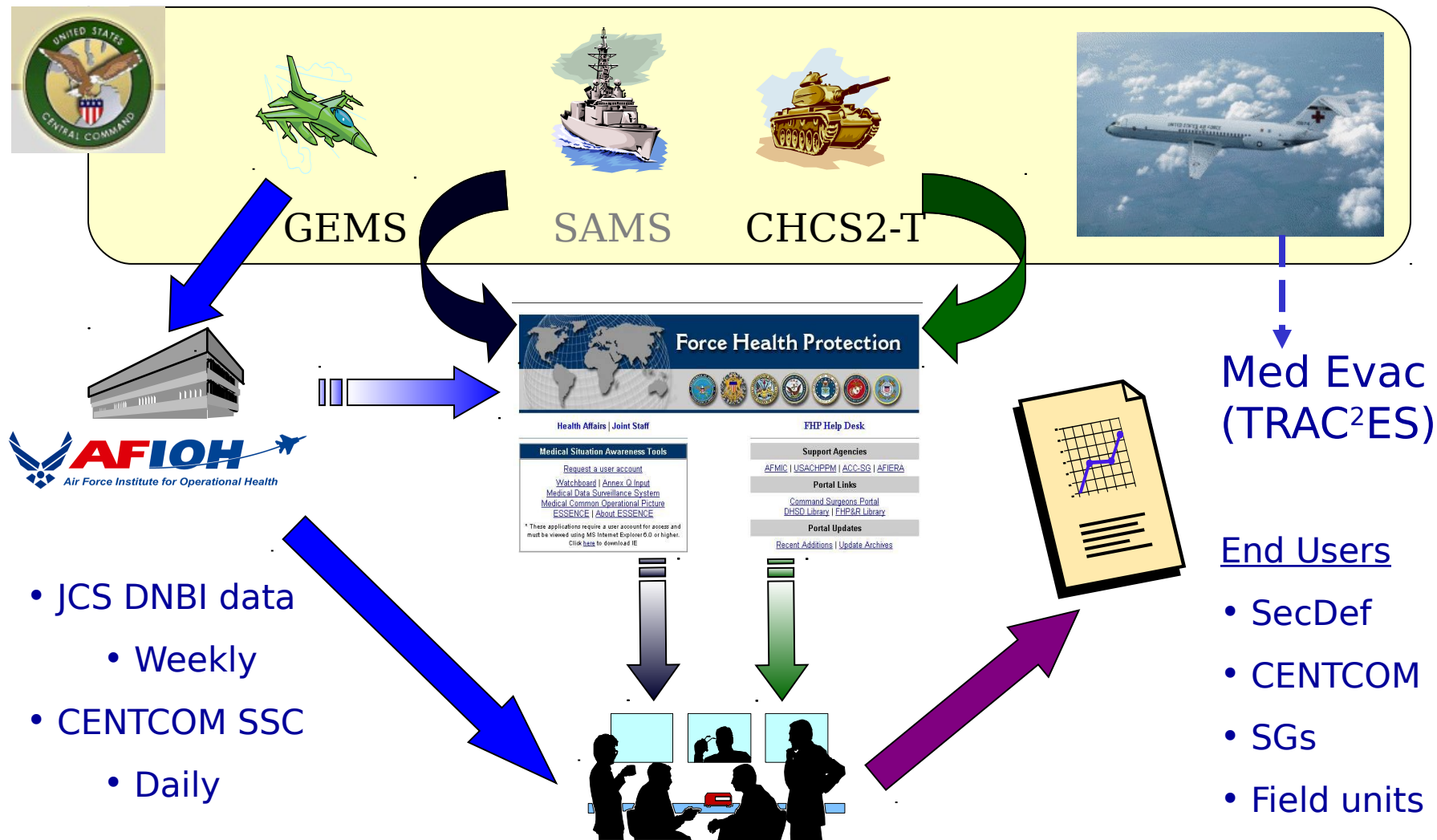
Site X— Fictitious Data

$\mu\text{g}/\text{m}^3/24 \text{ hr}$

Cases/1000



Theater Health Event Data Flow Patterns



Disease Non-battle Injury (DNBI) JCS- Mandated Categories



Dermatologic
GI, infections
Gynecologic
Ophthalmologic
Psychiatric
Combat stress
Respiratory
Intimate diseases
Fever, >24 hours
Neurologic (new)
All other, med/surg

Injuries, heat/cold
Injuries,
sports/recreation
Injuries, motor vehicle
Injuries, work/training

Problems:

Static since inception (1998)
Data 10-14 days old when analyzed
This won't detect WMD attacks

Solution?—Special Surveillance

CENTCOM Special DNBI Surveillance Categories (Daily)



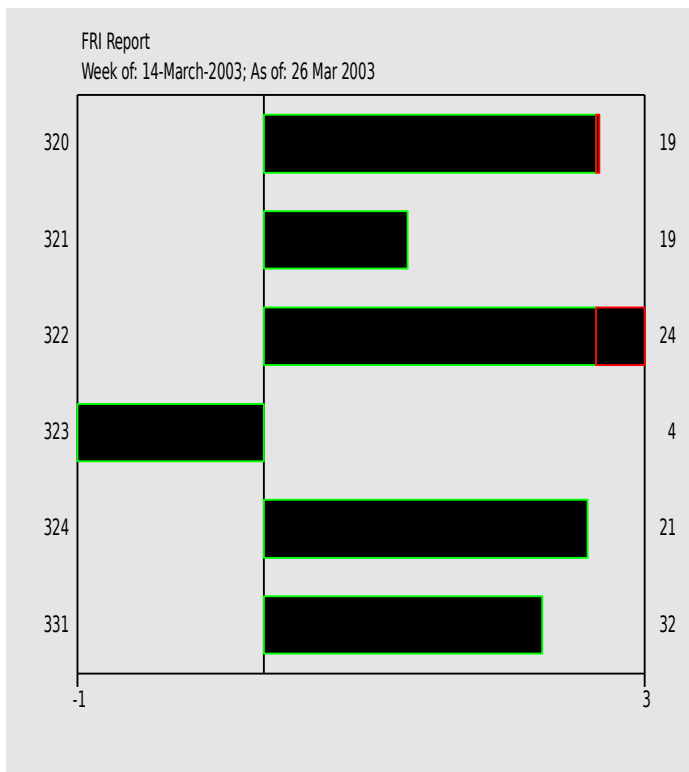
Category	Definition
Systemic Fever (generic flu-like prodromes, e.g., tularemia)	Unexplained temp > 38C (100.5F) for 24 hours or a history of chills and fever without a clear diagnosis. Includes flu-like illnesses with fever and multiple systemic complaints (such as cough).
Lower Respiratory Illness (anthrax)	Bronchitis, pneumonia, new onset reactive airway disease, pleurisy, or respiratory difficulty of unclear etiology
Infectious GI (ricin)	Any infection primarily manifested by vomiting and/or diarrhea.
Dermatologic Unclear Dx (s-pox)	Skin infections, blisters, ulcers, etc.
Unexplained Neuro	Cases of altered levels of consciousness, cranial nerve dysfunction, muscle



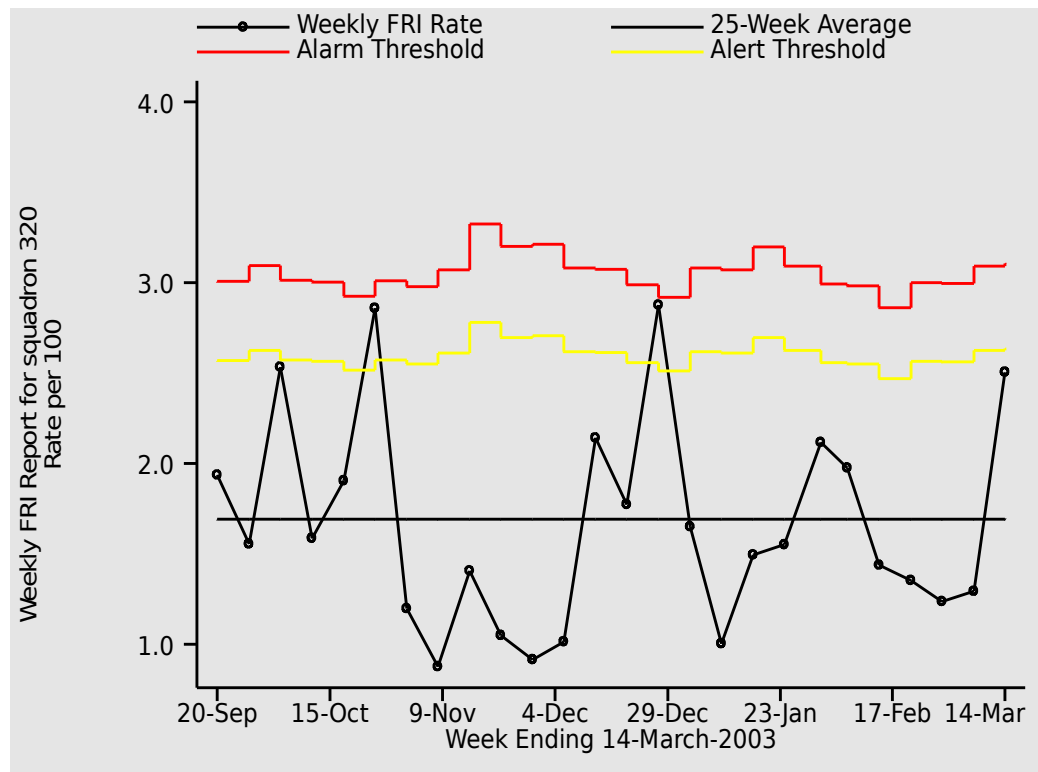
- Poisson statistics (z-score) for near-term, measures of central tendency for long-term
- Linear regression model using empirically derived baseline covering previous 4-12 weeks of data, replaced by exponentially weighted moving average when poor data fit
 - Geographic cluster spatial scan analysis available, but not used with theater data
- Change-point-detection approach



CPEG Chart



Process Control Chart



Recent & Historic DNBI Rates



DNBI Category	DNBI Rate per 100 (%) Personnel per Week						
	ODS/ S ¹	OJE ¹	OJG ²	Conflict Phase ³		Stabilization Phase ⁴	
				OEF	OIF	OEF	OIF
Dermatologic	0.93	0.72	0.92	0.66	0.61	0.51	0.44
GI, Infectious	0.87	0.45	0.45	0.72	0.34	0.47	0.34
Respiratory	1.04	1.00	2.09	0.99	1.04	0.62	0.44
Total Injury	1.19	1.95	2.19	1.42	0.96	1.39	1.03
Total DNBI	6.48	7.09	8.12	5.73	5.19	5.14	3.90

¹Sanchez, Craig, Kohlase, et al. Mil Med 2001;166:470-4.

²McKee, Kortepeter, Ljaamo. Mil Med 1998;163:733-42.

³Conflict Phase (not OEF) 15 March 2003 to 3 May 2003.

⁴14 May 2003 to 13 August 2004.

Data Source: AFIOH analyzed data on 27 August 2004.

Injury Pyramid Data Capture Garrison vs. Theater



In Garrison

Near Total

Near Total

Near Total

Near Total

Rare

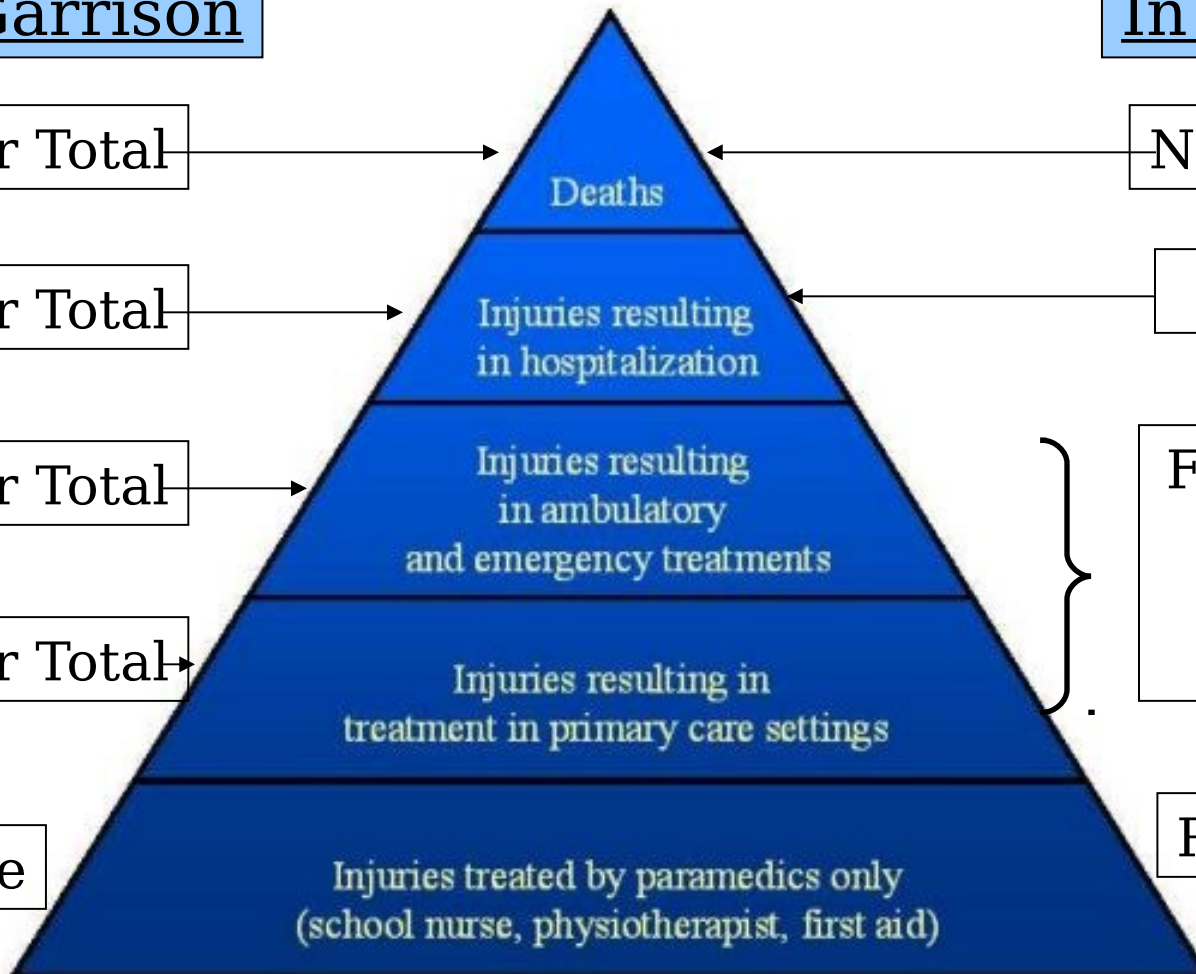
In Theater

Near Total

Fair

Fair to Poor,
combined
into one
category

Rare



Comparative Results Injury Rates (Theater vs. Garrison)



Data Source	Time Period	Avg Unclass Denominators*	Avg Cumulative Rate/1000
OIF (TRAC ² ES)	Mar 03-Jul 04	200,431	13
OEF (TRAC ² ES)	Mar 03-Jul 04	10,516	27.5
Garrison (Inptnt + Outptnt fx)	Jan 03-Mar 04	2,119,850	22
Garrison (Inptnt only)	Jan 03-Mar 04	2,119,850	3.9
Garrison (Outptnt only)	Jan 03-Mar 04	2,119,850	366

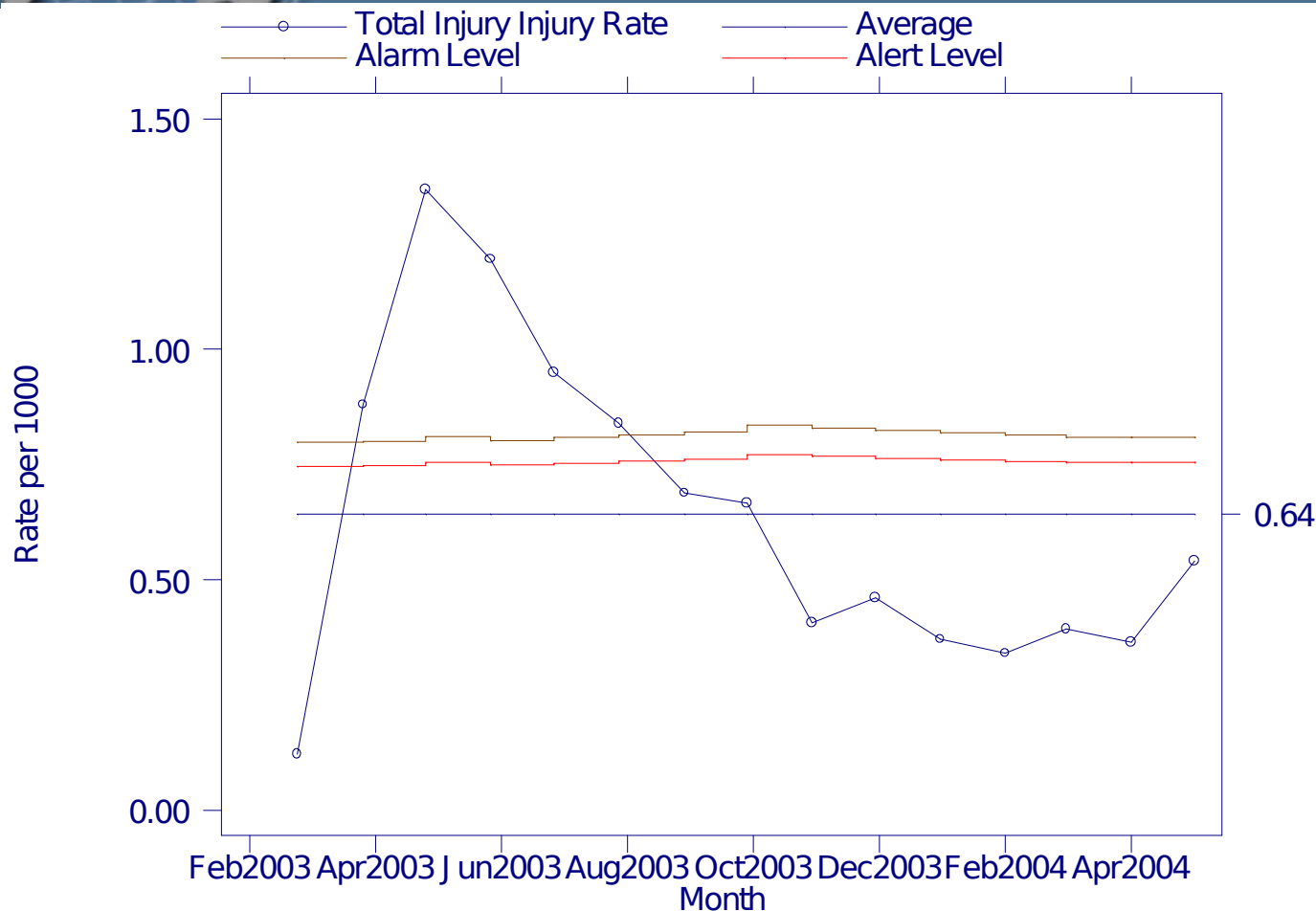
* In garrison denominator adjusted to account for deployed troops

DSOC Categories—Theater vs. Garrison

NRL D-1-1000 Categories Manual

Category	OIF 19 Mar 03-31 Jul 04	OEF 1 Oct 02-31 Jul 04	Garrison 1 Jan 03 -31 May 04
Head/Neck	³ 0.29	³ 1.45	⁴ 22.81
Shoulder/Arm	⁴ 1.62	⁴ 5.77	33.53
Hand/Wrist	1.36	4.77	28.23
Leg	0.32	1.31	8.31
Knee	⁵ 1.10	2.96	⁵ 30.71
Ankle/Foot	0.93	⁵ 3.25	² 78.92
Torso	¹ 2.82	¹ 7.73	¹ 92.88
Environment al	² 0.23	² 0.74	³ 9.44
Unspecified	1.82	6.73	66.03
Totals	10.48	34.73	370.86
<i>Annualized</i>	<i>8.11</i>	<i>19.85</i>	<i>261.78</i>
<i>Average/mo</i>	<i>0.66</i>	<i>0.25</i>	<i>21.82</i>

Total Injuries, OIF DSOC Schema, TRAC²ES Data



Avg monthly total NBI rate =
0.6/1000 Cumulative 17 month
rate = 10.5/1000

Top 10 OIF Injury Diagnoses Barell Matrix Pareto



Injury Rate Per 1000 Servicememb

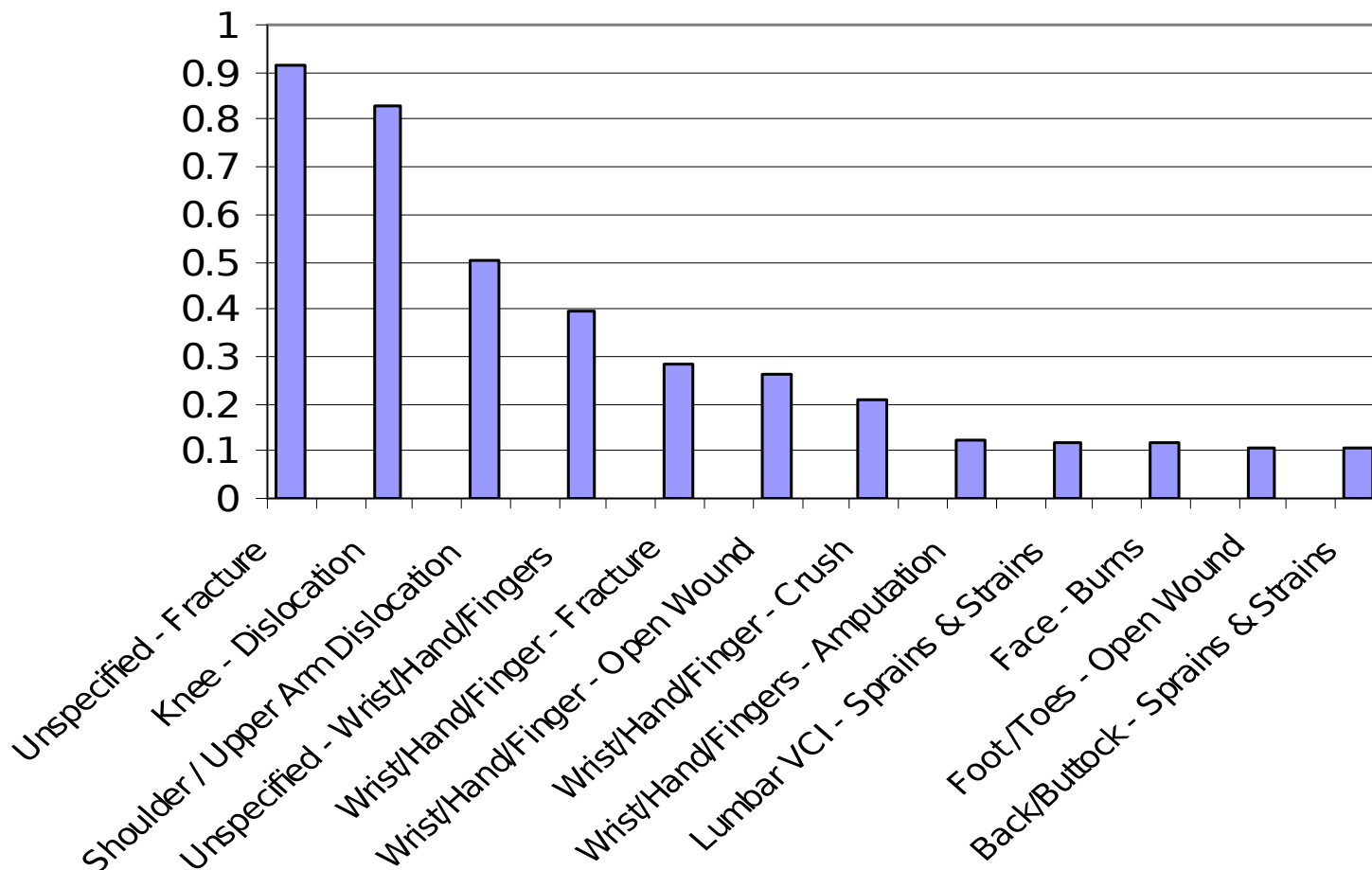


Chart includes all injuries
from TRAC2ES for 19 Mar 03

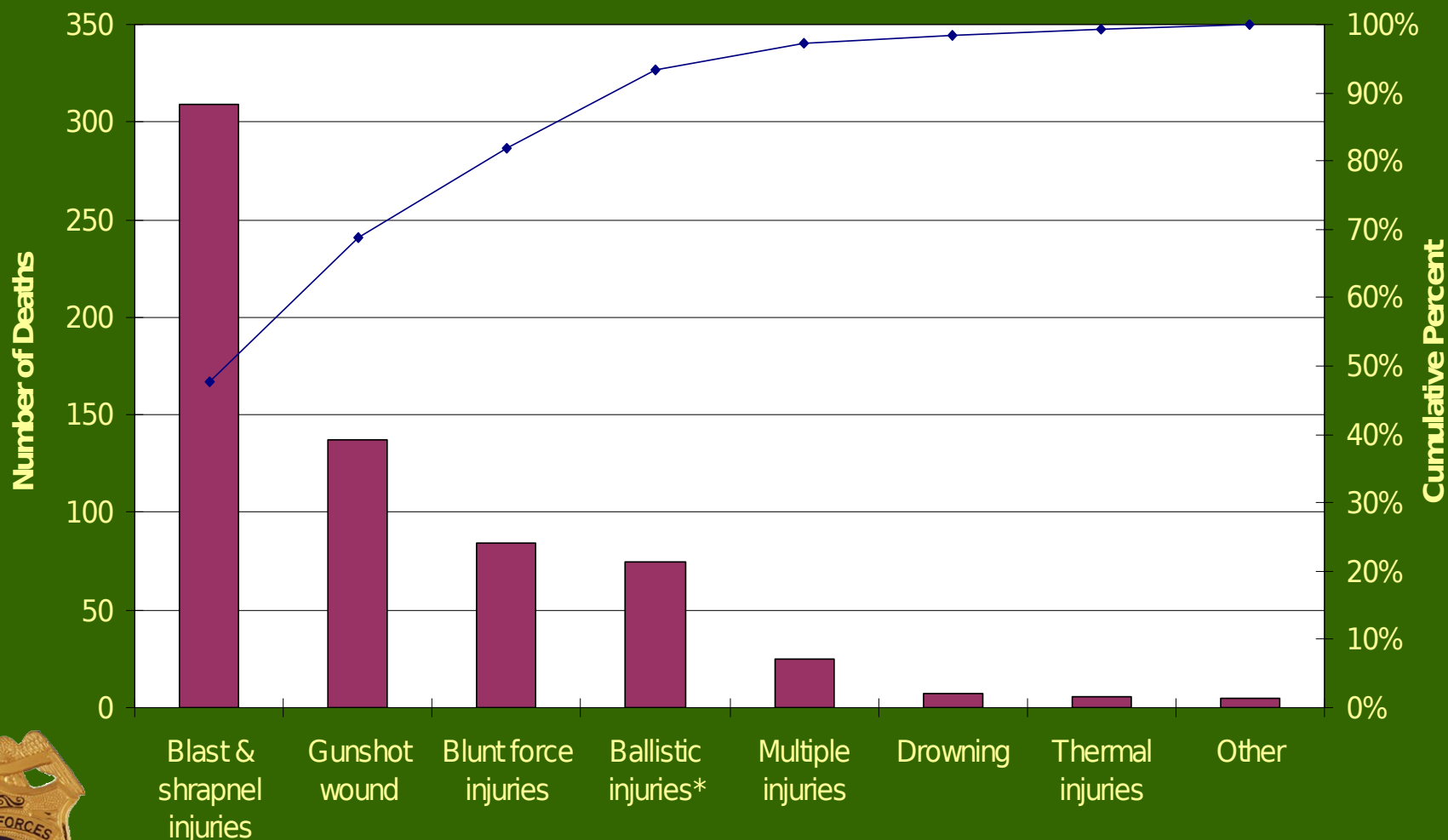
Mortality Data & Reports



- Casualty Reporting System
 - Personnel driven, categories assigned by personnel
- AFIP Medical Examiner Reports
 - 100% autopsies on all active duty deaths
 - Cause of death info vital to refining protective measures, driving research, etc.
 - Gold standard for mortality data. Lag time between for tox results and final report

OIF Causes of Hostile Death

All Services, 3/19/2003 - 7/31/2004
N=639 (total deaths=913)



Mortality Surveillance Division
Office of the Armed Forces Medical Examiner

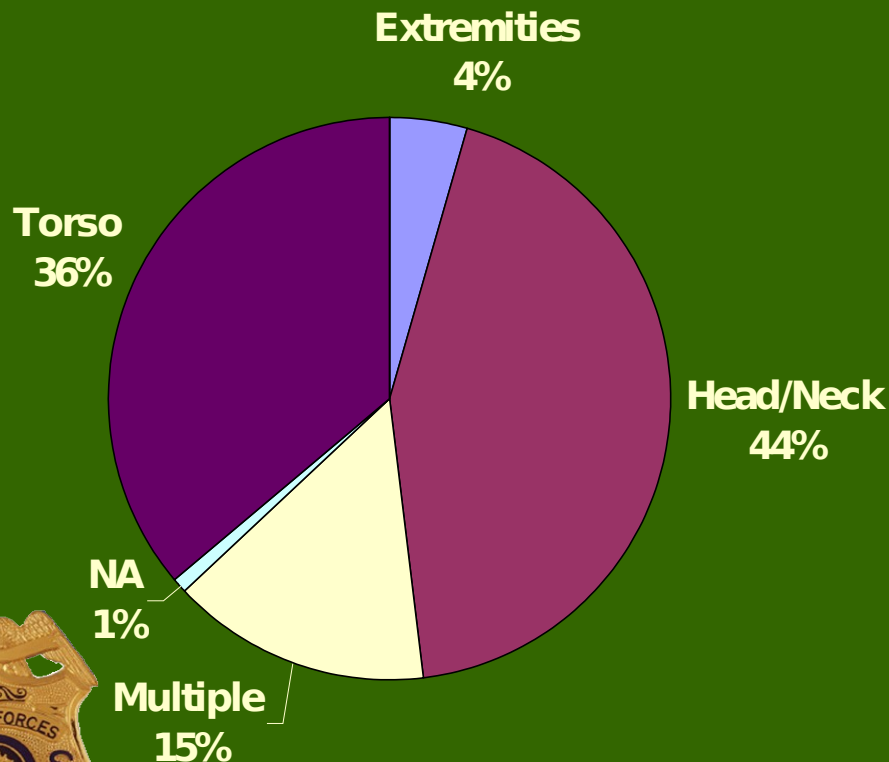
***Projectile injuries due to various mechanisms.**

OIF Hostile Deaths

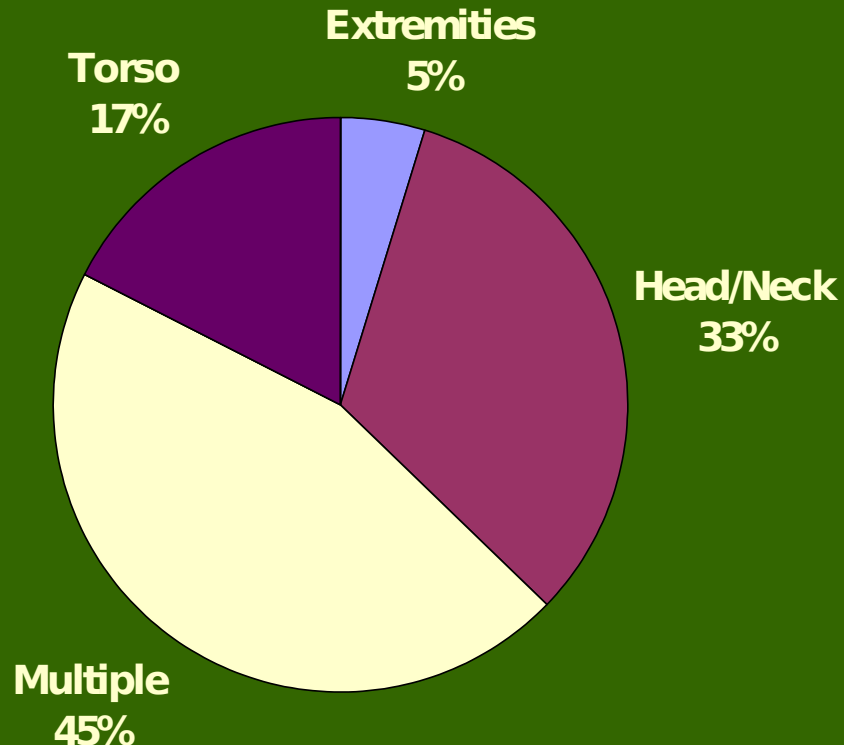


Lethal Injury Site: Explosives vs. Small Arms Fire
3/19/2003 - 7/31/2004

Small Arms N=160



Explosives N=450



Mortality Surveillance Division
Office of the Armed Forces Medical Examiner

Post-deployment Survey

DD Form 2796



- Self-assessment of individual health at end of deployment
- Ensure those who develop illnesses (or concerns) while deployed receive appropriate follow-up
- Monitor trends in concerns, sites with reported exposures, identify cohorts for additional study, identify risk communication topics

Survey Results, Partial



Service Member Responses since 01 Jan 03, % Affirmative
Active Duty with Reserve Component Value in
Parentheses

	General Health (fair or poor)	Medical/Dental Problems	Mental Health Concerns	Exposure Concerns	Health Concerns	Referral Indicated	Med Visit After Referral
Army	9 (11)	28 (40)	5 (6)	17 (22)	15 (22)	26 (26)	95 (82)
Navy	5 (5)	12 (34)	2 (2)	5 (18)	6 (18)	6 (15)	70 (87)
AF	2 (3)	11 (17)	1 (1)	6 (9)	5 (9)	10 (13)	88 (64)
Marine	6 (10)	18 (36)	2 (3)	12 (24)	8 (24)	11 (24)	61 (56)
Total	7 (9)	21 (37)	3 (5)	12 (21)	10 (20)	18 (33)	84 (78)

Source: Defense Medical Surveillance System

Deployment Surveillance Future Directions



- Fill critical data gaps (e.g., environmental exposure data, in-theater hospitalization/surgery data, reproductive health outcomes, cancer events, etc.)
- Automate data collection as much as possible
- Validate and refine syndromic categories, threshold determination, risk assessment methodologies, etc.
- Integrate diverse data streams (e.g., lab results, personnel data, geospatial data, etc.)
- Monitor cohorts (unusual exposures, risk groups, etc.)
- Evaluate new technologies (e.g., biomarkers, microarrays) and analytical approaches

Summary



- Health surveillance is a valuable tool to:
 - Detect, confirm, and/or characterize outbreaks (diseases, injuries, etc.)
 - A way to monitor the effectiveness of public health and preventive medicine programs
- Health surveillance will benefit from validation of best methods, standardization, user-friendly electronic systems, & improved reporting
- Greatest value is to forward units. High-level reports useful for answering questions from media & national leaders, but virtually no public health benefit due to dilution effect of aggregating data across wide geographic area and diverse environs



Questions and Discussion

Common Exposure Categories Identified in EOHWED



Environmental

- Airborne dust
- Air emissions from industry
- Endemic diseases
- Drinking water
- Hazardous waste sites
- NBC weapon exposure
- Hazardous animals/insects
- Agricultural emissions
- Depleted uranium
- Lead-based paint & asbestos

Occupational

- Noise
- Heat stress
- Airborne chemical exposure
- Contact chemical exposure
- Ionizing radiation
- Non-ionizing radiation
- Ergonomics
- Bloodborne pathogens

Distribution of Injury & Disease Data

ICD-9 Diagnostic Groups, TRAC²ES vs.

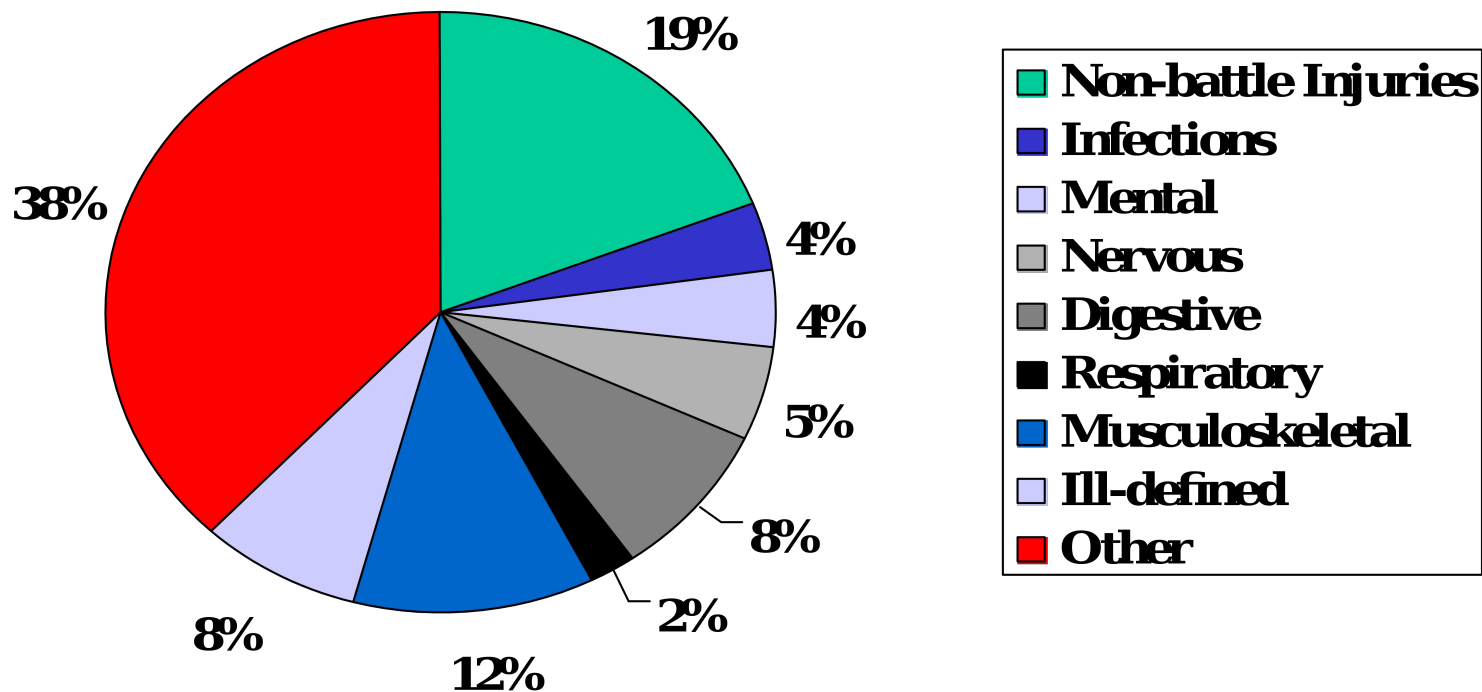


Category	OIF* Mar 03-Jul 04	OEF* Mar 03-Jul 04	Garrison * Jan 03-May 04
Non-battle Injuries	12.78	27.46	370.35
Infections	2.47	1.82	Not Available
Mental	2.82	8.85	Not Available
Nervous	3.25	6.20	Not Available
Digestive	5.56	10.16	Not Available
Respiratory	1.40	3.57	Not Available

* Injury Rate Per 1,000 Service Members

OIF TRAC²ES Data

Principal ICD-9 Diagnostic Groups



Compares favorably with
Marine hospitalization
data from Vietnam

Disease, Non-battle Injury Weekly DNBI



JCS broad-based disease categories, e.g., Respiratory, GI, Derm, Injuries (4 types), etc.

Data Characteristics:

compliance highly variable. Last week's data analyzed by Wed/Thu of following week. Accuracy also varies due to multiple data collection systems, some manually assigned, others based on ICD-9 codes as entered by field medical

Findings/Actions/Results

- Documented natural disease outbreaks that were already recognized by field
 - Thanksgiving "food poisoning"
 - Norovirus on aircraft carrier
- Outbreaks found by other

staff, most who don't have training in coding.

Future Directions
• Facilitate better compliance and improved accuracy via TMIP, e.g., CHCS2-T

- Add inpatient electronic data collection
- Evaluate value of other category definitions and more frequent DNBI data collection, e.g., daily

Aeromedical Evacuations TRAC²ES



Aeromedical evacuation tracking data serves as a surrogate for in-theater inpatient disease and injury rates.

Data Characteristics: severity biased. Preliminary, often unconfirmed diagnoses subject to change during and after evacuation. Web-enabled data entry with immediate transmission to central database facilitates real-time analysis.

Findings/Actions/Results

- Used primarily to answer questions about injury patterns. Provides some insight about requisite in-theater resource levels (equipment, specialty mix, etc.)

Future Directions

Safety Reports In-theater Investigations



Description:

Data Characteristics:

Findings/Actions/Results

- Helicopter crashes
- Motor vehicle crashes, in-theater steps taken to reverse trend
- Sports and recreation injuries, periodic efforts to address, as in CONUS

Future Directions